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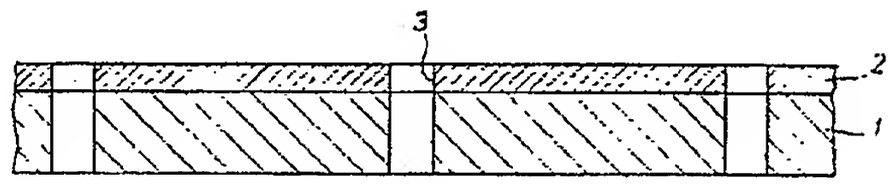
(54) **Water-absorptive sheet for food package.**

(57) The invention provides an absorptive sheet suitable for food packaging and comprising a water absorptive non-woven sheet (1). This may have a protective sheet (2) firmly combined therewith on one or both faces; the protective sheet needs to allow passage of liquid, e.g. by way of perforations (3).

Fig. 1



EP 0 320 314 A2

Description

WATER-ABSORPTIVE SHEET FOR FOOD PACKAGE

The present invention relates to a water-absorptive sheet for absorbing drips from fresh food such as meat, fish, etc. or absorbing condensed dew generated from food.

When fresh food, such as meat, fish, etc., is packed in a tray-wrap package, drips or condensed dew are generated in the course of storage, transportation, or display, not only impairing the appearance of the package but also lowering the freshness of the food.

As means for absorbing such drips, there have been proposed sheet materials composed of cellulosic fibers, such as woven or knitted fabric, non woven fabric, or paper-like material (Japanese Utility Model Publication No. 5349/79), and sheet materials made of a high molecular absorber in powder form covered with paper or non-woven fabric (Japanese Utility Model Kokai (Laid-open) No. 49779/83).

However, since the sheet materials of cellulosic fibers absorb drips by capillary action, the quantity absorbed is very small, and in addition, the drip color spreads around the contact area with the packed content. giving an ugly appearance; moreover they release absorbed water when pressure is applied, and thus they are extremely low in water retentivity.

Furthermore, although the sheet materials composed of a high molecular absorber in powder form have high absorbtive power for drips, they have the following defects: they are very difficult to process into sheet form; they have a small area of water absorption, which results in slow absorption; since there is no movement of absorbed water in them, so-called "blocking" occurs which presses out water-containing gel, and tends to impair appearance and adhere to food; moreover, coupled with large absorbing power of individual high molecular absorbers, the degree of freedom of absorbed and retained water becomes large, and hence they are liable to become culture grounds for bacteria.

The object of the present invention is to provide a water-absorptive sheet for food packages which is free from hydrogel leakage, adhesion to food, and gel touch (a slimy feel peculiar to hydrogels), is of good liquid absorptive and retentive power, and has practical strength.

The invention provides an absorptive sheet composed solely of a water-absorptive non-woven sheet. or of an absorptive sheet provided with a protective sheet on the upper surface or on both upper and lower surfaces thereof.

The invention is further explained with reference to the accompanying drawings, in which Figs 1 to 4 are enlarged cross-sectional views of four embodiments of the invention; and Fig. 5 is a disassembled perspective view, and Fig. 6 is a vertical cross-sectional view. of an embodiment in use.

Fig. 1 is an absorptive sheet composed on an absorptive non-woven sheet (1) with a protective sheet (2) provided on its upper surface (which comes into contact with food) and is an example in which a large number of fine holes (3) extend through both sheets (1, 2).

In Figs. 2 and 3, an opaque film is used as the protective sheet (2) for the upper surface. Fig. 2 is an example of providing a plurality of fine holes (3) extending through the whole absorptive sheet and Fig. 3 is an example of providing fine holes (3) only through the opaque film. As protective sheet (2') for the other side, there may be used a transparent or opaque film or a non-woven fabric.

Fig. 4 is an example in which a non-woven fabric, woven fabric or knit fabric is used at least as the protective sheet (2) and fine holes are not provided.

The water-absorptive non-woven sheet (1) is a dry- or wet-processed non-woven fabric composed solely of highly water-absorptive fibers, or a mixture of two kinds of fiber, e.g. said fibers and heat adhesive fibers, or of three or more kinds of fiber, e.g. said two kinds of fiber and another kind of fiber.

Any highly water-absorptive fibers may be used, e.g. those which have a water-swellability (ratio of water that can be absorbed for the weight of the fibers) of 3 or more, preferably from 5 to 200. For example, there may be mentioned fibrous forms of acrylonitrile- acrylic acid salt copolymer, heat-treated polyacrylic acid salt- polyhydric alcohol copolymer, saponified starch- acrylonitrile copolymer, saponified vinyl acetate- acrylic acid ester copolymer, saponified vinyl acetate- unsaturated dicarboxylic acid copolymer; water-absorptively modified (hydrogelled) acrylic fibers, cellulosic fibers, polyvinyl alcohol fibers, etc.; fibers whose surfaces are covered with a hydrophilic polymer, etc. Among others, highly water-absorptive composite fibers containing carboxyl groups in an amount of 0.5-4.0 m mol/g, representative of which is LANSEAL (a registered trade mark of Japan Exlan Company, Limited) are desirable since they have no problems in shaping and no problems of giving way under water absorption - because of their having excellent water-swellability and maintaining a practical level of physical properties such as tensile strength and elongation. It is also desirable to bring the degree of neutralization of carboxyl groups to less than 90%, preferably to from 20 to 80%, since the remaining acid-type carboxyl groups (-COOH) can thereby selectively absorb ammonia, amines, etc.

As heat-adhesive fibers, there may be used synthetic fibers such as those of polypropylene, polyethylene, polyester, etc. which can heat-adhere at a comparatively low temperature. Furthermore, depending upon conditions, such synthetic fibers may be used in combination with other fibers suitably selected from other synthetic fibers, regenerated fibers, natural fibers, etc.

For combining the water-absorptive non-woven fabric sheet (1) with the protective sheet(s) (2, 2'), lamination-bonding using an adhesive is possible. However, a heat-adhesion method using hot gas, hot rolls, hot needles, etc. is industrially favorable. From such a viewpoint, it is desirable that the non-woven

sheet (1) should be composed of highly water-absorptive fibers in an amount of 95-5 weight %, preferably 80-40 weight %, and heat-adhesive fibers in an amount of 5-95, preferably 20-60 weight %.

The non-woven sheet (1) desirably has a water-swellability of 3 times or more, preferably 5 times or more.

The protective sheets (2, 2') when provided on both surfaces of the non-woven sheet (1) may be the same or different; there is no restriction as to materials, but there is suitably employed on a non-woven fabric, knit or woven fabric, film of thermoplastic resin, or fibers of thermoplastic resin (heat-adhesive fibers). Among others, by employing a known opaque film made of polyethylene, polypropylene, etc. as the upper surface protective sheet (2), it is possible to effectively conceal the water-absorptive non-woven sheet (1) which has been colored by absorbing drips, etc. Good appearance can thus be obtained, and at the same time there are no problems of adhesion of single filaments to food, etc., since there is no direct contact of food, etc. with fibers.

Since at least the upper surface protective sheet (2) needs to be water-permeable, when film is used for the protective sheet (2) it is provided with a plurality of fine holes (3). But, when using non-woven fabric, etc. which has water permeability in itself, there is no necessity for fine holes (3), though it is permissible to provide them. Non-woven fabrics, etc. are not required to be formed solely of heat-adhesive fibers, but they may be suitably blended with other fibers such as natural fibers, regenerated fibers, semi-synthetic fibers, etc.

As a method of combining the water-absorptive non-woven sheet (1) and the protective sheet(s) (2, 2'), heat-adhesion is industrially favorable. Among others, when hot needles are used, fine holes (3) can be formed simultaneously with heat-adhesion. Furthermore since each of the sheets is bonded by dots, the elasticity and absorptive power of the finally obtained absorptive sheet is not impaired, and thus the use of hot needles is particularly desirable.

When the protective sheets or sheet (2 and/or 2') is a non-woven fabric, the non-woven fabric may be formed by laminating and integrating the webs obtained by carding the fibers composing the water-absorptive non-woven sheet (1) and the protective sheet(s), respectively, or each of both sheets may be made by laminating a plurality of webs.

As shown in Figs. 5 and 6, the sheet material according to the present invention can be used by locating it, e.g. with adhesive, etc. in the bottom of a package container such as a tray. When a food (A) is packed in the package container (4), the drips from food (A) pass through the fine holes or openings of the protective sheet (2) and are absorbed by the non-woven sheet (1), a stable water-retaining form being thus maintained. Incidentally, the absorptive sheet of the present invention is not limited to such use in packages for food, but also it can be applied to other uses as a water-absorptive sheet for food, etc.

Examples

Water activity value was measured in the usual way using the sheet material of Fig. 1. As a comparative example, measurement was made with cellulosic water-absorbing paper sold on the market. The results are shown in Table 1. Incidentally, the non-woven sheet (1) is composed of 60% LANSEAL ® (single-filament denier: 5 d; fiber length: 51 mm; degree of water-swellability: 150 times; carboxyl groups: 2.3 m mol/g) and 40% bicomponent side-by-side type polyolefine composite fibers (low density polyethylene: crystalline polypropylene = 1:1; 3 d x 51 mm) and its weight per area is 30 g/m^2. The protective sheet (2) is a polypropylene film having a weight per area of 30 g/m^2.

Table 1

	Product of Example	Product of Comparative Example
No water added	0.433	0.535
10% water added	0.454	0.885
20% water added	0.521	0.972

As apparent from Table 1, the Example showed a marked lowering of the water activity value in comparison with the Comparative Example.

In addition, a microorganism propagation test was conducted by adding 1 ml bacteria liquid of Bacillus subtilis to the sheet material of the present invention, and measuring the number of bacteria after standing at 35°C for 24 hours. As a comparative product, cellulosic water-absorbing paper sold on the market was used. The results are shown in Table 2.

Table 2

	At the start	After 24 hours
Product of Example	12	11
Product of Comparative Example	12	More than 10^4

As apparent from the above Table, no propagation of bacteria was observed even after 24 hours in the sheet material according to the present invention, bacteriostatic action thus being obviously shown.

We are not able to exactly explain the mecanism of this bacteriostatic action, however we suppose that, since the sheet material of the present invention holds absorbed water in a fine and complicated structure of entangled fibers, the degree of freedom of water molecules is restricted to markedly lower the water activity, and thus the sheet material is unsuited to become a culture

ground of bacteria, etc.

Since the products of the present invention does not use powdery hydrogels for the water-absorptive non-woven sheet (1), there are no problems of hydrogel leakage or adhesion of hydrogels to food, etc. Furthermore, since the highly water-absorptive fibers have a larger surface area in comparison with powdery hydrogels, they give faster absorption. Moreover, since they have an excellent absorptive ability and retaining power, there is no problem of diffusion of drips resulting from capillary action.

In addition, since the absorption and retention of drips are conducted in a fine and complicated structure of entangled fibers, the absorbed water is retained securely, and this leads to a fall of water activity and hinders the sheet from becoming a culture ground for bacteria.

Furthermore, when an opaque film is used as the protective sheet on the side which comes into contact with food, etc., the appearance is further improved by the concealing effect, and moreover there are no problems of adhesion of single fibers to food, etc. by contact of food, etc. with fibers.

The invention thus provides an absorptive sheet suitable for food packaging and comprising a water absorptive non-woven sheet. This may have a protective sheet firmly combined therewith (e.g. integrally or by adhesive) on one or both faces; where there is a protective sheet on each face, the two protective sheets, and their mode of combination with the non-woven sheet, may be the same or different. Where the water absorptive non-woven sheet and a protective sheet are heat-bondable, then heat bonding (e.g. by hot needling) can give substantially integral combination thereof. A protective sheet on the face of the water absorptive non-woven sheet to be uppermost needs to allow the passage of liquid therethrough into said absorptive sheet; where this protective sheet is on inherently water-impermeable material (e.g. a plastics film or sheet), it may be perforate for this purpose - e.g. perforated by the above-mentioned hot needling. The water absorptive non-woven sheet preferably has an opaque protective sheet on at least one surface to mask the color of liquid taken up by the said absorptive sheet. The non-woven water absorptive sheet constituting or forming part of the invention preferably has fibers with a layer of hydrogel around a core of acrylonitrile polymer; the fibers preferably contain carboxyl groups in an amount of 0,5-4,0 m mol/g.

Claims

1. An absorptive sheet for food packing which comprises a water absorptive non-woven sheet.

2. An absorptive sheet as claimed in claim 1 wherein a protective sheet is provided on one or both surfaces of the water absorptive non-woven sheet.

3. An absorptive sheet as claimed in claim 1 or 2 wherein the water absorptive non-woven sheet has a water-swellability of 3 times or more.

4. An absorptive sheet as claimed in claim 1 or 2 or 3 wherein the water absorptive non-woven sheet is made of highly water absorptive fibers alone or of a mixture containing said fibers and heat adhesive fibers.

5. An absorptive sheet as claimed in any preceding claim wherein the non-woven water-absorptive sheet has fibers with a layer of hydrogel around a core of acrylonitrile polymer, the fibers containing carboxyl groups in an amount of 0,5-4,0 m mol/g.

6. An absorptive sheet as claimed in any preceding claim having an upper protective sheet which is opaque.

7. An absorptive sheet as claimed in any preceding claim having a protective sheet secured on a face of the water-absorptive non-woven sheet by hot needling, said protective sheet in the combination having fine holes therethrough.

8. An absorptive food packaging sheet comprising a water-absorptive non-woven sheet combined on a face thereof with a protective sheet which allows (e.g. by way of being perforate) the passage of liquid therethrough into said water absorptive non-woven sheet.

9. A packaging sheet according to claim 8 wherein the non-woven and protective sheets are combined by hot needling.

10. A packaging sheet according to claim 8 or 9 wherein the protective sheet is opaque.

Fig. 1

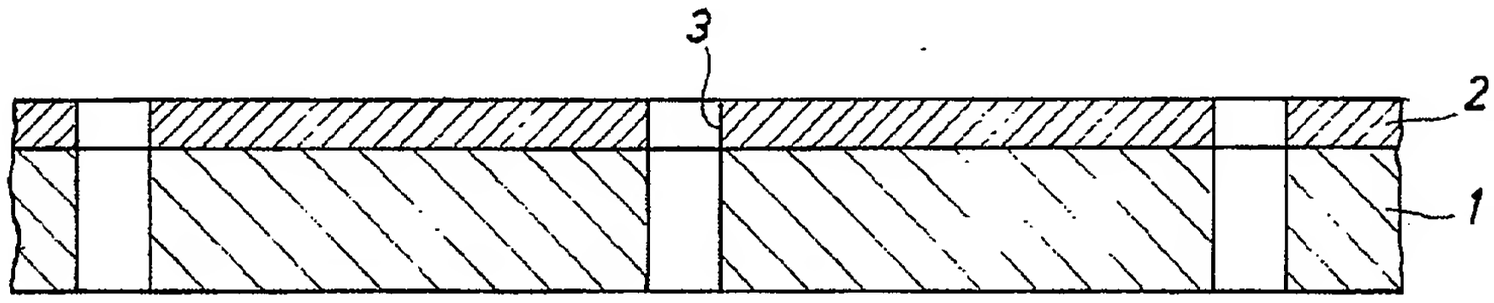


Fig. 2

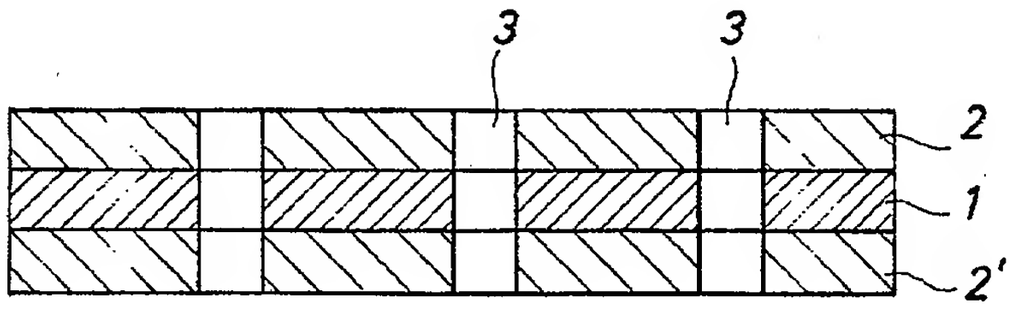


Fig. 3

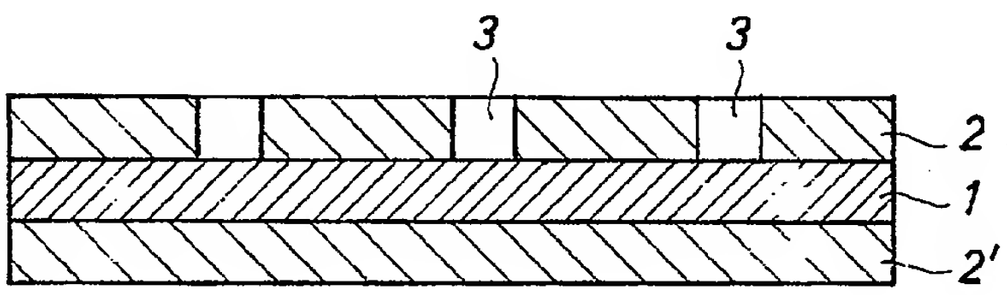


Fig. 4

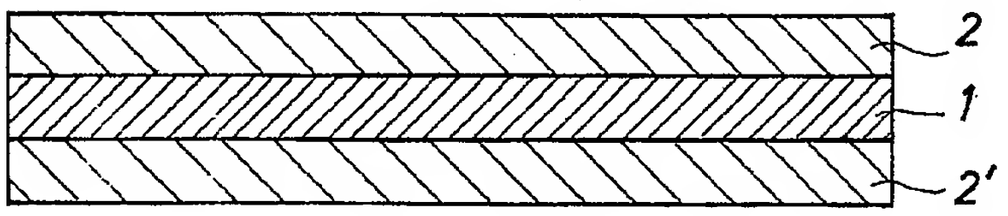


Fig. 5

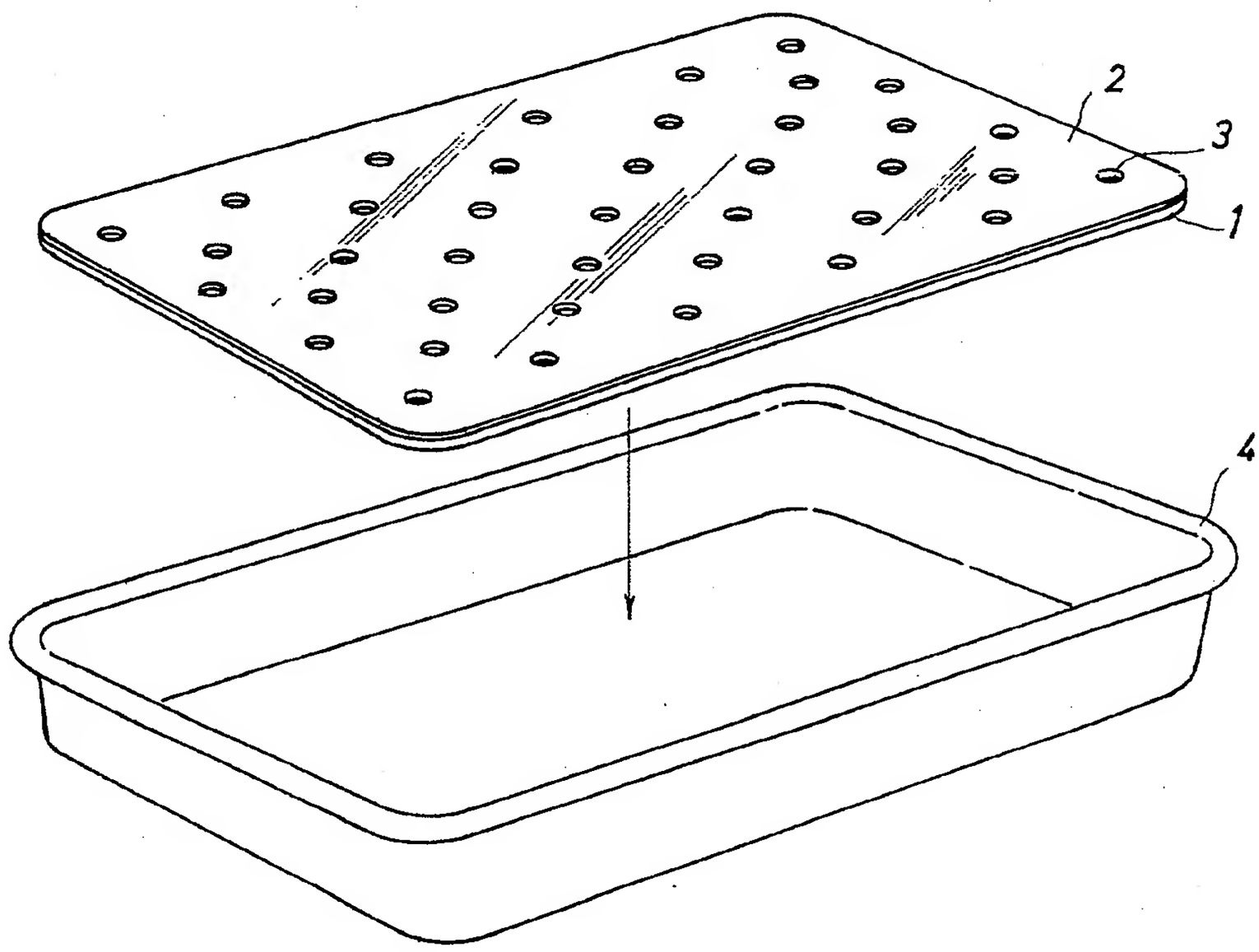


Fig. 6